Macquarie Generation

Management of Negative Inter-Regional Settlements Residues

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Mr John Pierce
Chairman
Australian Energy Market Commission
PO Box A2449
SYDNEY SOUTH NSW 1235

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Dear Mr Pierce

Macquarie Generation welcomes the opportunity to comment on the AEMC's *Issues Paper, Management of negative inter-regional settlement residues*, as published on 18 April 2013.

Macquarie Generation is concerned that the increase in the negative inter-regional settlement residue (IRSR) intervention threshold from $6,000 to $100,000 and changes to AEMO's negative residue management procedures have resulted in some unusual market outcomes. Over the last 12 months we have observed a pattern of 'cycling' behavior where the intervention trigger is breached and reset over a period of hours, sometimes extending over trading days. The higher threshold also allows the accumulation of much higher negative IRSRs during single events. The following submission proposes several changes which would limit the frequency and cost of negative IRSR management.

'Cycling' and the higher $100,000 threshold

The increase in the intervention trigger to $100,000 has seen the emergence of a pattern of bidding behaviour that can result in a 'cycling' of negative residue management activation and deactivation. Remote generators in the higher priced region can bid in ways to relieve NRM constraints on an interconnector that was otherwise "clamped" to limit negatively priced flows. Should this occur for three or more dispatch intervals, AEMO's NRM constraint equations are deactivated and the negative residue accumulation calculation is reset to zero dollars. This then allows for a further period of negative residue accumulation until the $100,000 threshold is once again breached or is breached in pre-dispatch. The cycle may continue over a period of hours extending across multiple trading days depending on the degree of congestion and demand conditions in the respective regions.

An example of an actual trading day with multiple cycling events is 18 January 2013, involving negative residue accumulation on the NSW-Queensland interconnector for southward flow. The following table shows the time the NRM constraints were activated and deactivated, and the value of negative IRSRs for each of the three events.

There was a further period of counter-price flows between 21:35 and 23:55 resulting in total negative residues of almost $32,000, where the NRM constraint equations were not triggered. Total negative residues for the day were some $570,000, the full cost of which was borne by NSW customers through lower settlement residue auction payments to the NSW TNSP.

Table 1:Negative residue management, Queensland to NSW, 18/01/13

Time activated	*Time deactivated*	*Negative IRSR accumulated*
00:05	00:55	$63,100*
06:40	08:00	$213,463
08:40	10:00	$195,264

* NRM was initiated at 00:05 on 18/1/13 due to accumulation of negative IRSR post 22:00 on 17/1/13 and forecast of continuing accumulation of negative IRSRs until 01:00

Automation allows for a lower intervention threshold

The key development in the last three years has been AEMO's automation of negative inter-regional settlement residue management. Before this system was introduced in July 2012, AEMO's control room was required to manually implement constraint changes. As recognised by AEMO at the time, "during periods of high workload or when managing power system security is the highest priority, this may not always happen expeditiously".[1] Macquarie Generation observed that AEMO's manual system was far from predictable, sometimes taking effect too early, but more often than not AEMO acted too late to contain negative IRSRs.

The introduction of AEMO's automated NRM constraint equations makes negative IRSR management highly transparent for market participants and relatively straightforward for AEMO to manage any level of intervention threshold. While there is no right or precise threshold, we consider that a return to a $6,000 trigger provides an appropriate balance between limiting customer exposure to large and variable IRSR costs and allowing generators to respond to dispatch price signals.

By way of example, the following tables provide a real time example of the different settlement outcomes under a $6,000 and $100,000 threshold for an event that occurred on 28 May 2013. Table 2 shows that the $100,000 threshold allowed the accumulation of $263,770 in negative IRSRs for the 18:00 trading interval. The 30 minute trading interval includes six five minute dispatch intervals, which when averaged resulted in a substantial breach of the intervention threshold. However, the individual dispatch

[1] AEMO, *Brief on Automation of Negative Residue Management*, Electricity Market Performance, 8 June 2012, p. 5.

interval outcome for 17:45 did not breach the $100,000 threshold and therefore NRM did not activate until the calculation at the end of the trading interval at 18:00. Table 3 shows dispatch outcomes with a $6,000 intervention threshold. In this case, AEMO's automated constraint equations would take effect from dispatch interval 17:45, stopping any further counter-price flows for the remainder of the trading interval. This approach would have resulted in positive IRSRs of $12,783 for the trading interval, an overall saving to customers in NSW of $276,553 from just one half-hour trading interval.

Table 2:AEMO negative residue management, $100,000 threshold, 28/05/13

	Vic-NSW RPP difference	*Vic-NSW flow*	*IRSRs*
17:35	-$2.06	-98	$17
17:40	-$199.40	-90	$1,496
17:45	-$8,028.84	76	-$50,849
17:50	$2.72	536	$121
17:55	$4.15	874	$302
18:00	$5.60	1,013	$473
18:00 trading interval	-$1,369.64	385	-$263,770

Table 3:AEMO negative residue management, $6,000 threshold, 28/05/13

	Vic-NSW RPP difference	Vic-NSW flow	
17:35	-$2.06	-98	$17
17:40	-$199.40	-90	$1,496
17:45	-$8,028.84	76	-$50,849
17:50	$2.72	0	$0
17:55	$4.15	0	$0
18:00	$5.60	0	$0
18:00 trading interval	-$1,369.64	-19	$12,783

A similar negative IRSR event occurred on 30 May 2013 for southward flows on the NSW to Queensland interconnector, where once again, negative residue management did not commence until the end of the period 18:00 trading interval, which resulted in negative IRSRs totaling $395,175.

Negative residue management constraint equations

Macquarie Generation notes that when the AEMC instructed AEMO to raise the intervention threshold to $100,000 it gave full discretion to AEMO to implement the procedures for triggering the threshold. It is in the way that AEMO has chosen to implement the threshold and formulated the NRM constraint equations that allows the practice of cycling to go on.

As well as lowering the overall intervention threshold, Macquarie Generation considers that there are a number of improvements that could be made to AEMO's automated constraint equations – as outlined in Tables 4. The key proposed changes to the response levels include:

- making the relaxation and tightening of the clamping constraints symmetrical. The current thresholds allow for a relatively slow release of flows once positive residues start to accrue.
- introducing a new threshold of above $10,000 per dispatch interval for both negative and positive residues – allows the NRM equations to clamp harder to quickly contain large negative IRSRs or relax faster if positive residues accrue.
- increasing the steps in interconnector flows for dispatch intervals with negative and positive residues above $10,000.

Table 4:NRM constraint equations, proposed steps and thresholds, per interconnector

NRM_DI_AMT (NR$) Interconnector constraint	NR$< 10,000	-10,000 <= NR$< -5000	-5,000 <= NR$< -1000	-1,000 <=NR$ < 1,000
NRM_NSW1_QLD1	-200 MW	-100 MW	-50 MW	0 MW
NRM_QLD1_NSW1	-200 MW	-100 MW	-50 MW	0 MW
NRM_NSW1_VIC1	-200 MW	-100 MW	-50 MW	0 MW
NRM_VIC1_NSW1	-200 MW	-100 MW	-50 MW	0 MW
NRM_VIC1_SA1	-100 MW	-60 MW	-30 MW	0 MW
NRM_SA1_VIC1	-60 MW	-50 MW	-25 MW	0 MW

Table 4 cont: NRM constraint equations, proposed steps and thresholds, per interconnector

NRM_DI_AMT (NR$) Interconnector constraint	1,000 >= NR$> 5,000	$5,000 >= NR$> $10,000	NR$> 10,000
NRM_NSW1_QLD1	50 MW	100 MW	200 MW
NRM_QLD1_NSW1	50 MW	100 MW	200 MW
NRM_NSW1_VIC1	50 MW	100 MW	200 MW
NRM_VIC1_NSW1	50 MW	100 MW	200 MW
NRM_VIC1_SA1	30 MW	60 MW	100 MW
NRM_SA1_VIC1	25 MW	50 MW	60 MW

An alternative NRM relaxation process

The existing NRM constraint equations automatically cancel at the end of the next trading interval following the commencement of accumulation of positive residues.

Once cancelled, interconnector flow returns to flows limited by normal NEMDE dispatch. This has often resulted in the immediate recommencement of negative residues, where once again the threshold is required to be breached before negative residue management is recommenced and also large discontinuities in dispatch outcomes for individual generators.

An alternative approach following the end of the trading interval would allow interconnector flows to only increase at the rates detailed in Table 4 until such time as normal NEMDE function returns. In the event that the relaxation of the constraint results in accumulation of negative residues the automation process would then reduce interconnector flows at the next dispatch interval to minimise or prevent accumulation of additional negative settlement residues. Depending on the level of negative or positive residues accumulated, the automated system would result in the optimised interconnector flow to prevent accumulation of further negative residues.

Summary

Macquarie Generation supports the use of a clamping mechanism to limit the accumulation of large and variable negative IRSRs in the current regional NEM framework. The move to a fully automated constraint management system enables AEMO to manage such events without having to manually implement constraints to control flows in near real time.

Macquarie Generation supports a reduction in the intervention threshold to $6,000 and a number of improvements to the steps and thresholds in the NRM constraint equations. We consider that these changes, in combination, will reduce the frequency of generator bidding which has caused a recent increase in the 'cycling' of the NRM constraints. In addition, the changes will reduce the scope for large one-off negative IRSR events. TNSP customers will face lower and less volatile negative IRSR costs if these changes are adopted.

Yours sincerely

LEISL BAUMGARTNER
GENERAL MANAGER CORPORATE AFFAIRS

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Macquarie Generation

Contact Details

Corporate Office
34 Griffiths Road
Lambton NSW 2299
Australia

Postal Address
PO Box 38
Hunter Region MC
NSW 2310
Australia

Telephone 61 2 4968 7499

Facsimile 61 2 4968 7433

Business Hours
8am–5pm Monday to Friday

Liddell Power Station and Bayswater Power Station

New England Highway,
Muswellbrook NSW 2333
Australia

Postal Address
Private Mail Bag 2
Muswellbrook NSW 2333
Australia

Liddell Telephone 61 2 6542 1611

Bayswater Telephone 61 2 6542 0711

Business Hours Administration
8am–4pm Monday to Friday

Security and Operations
24 hours 7 days

Web site address
www.macgen.com.au

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